United Nations E/CN.17/1998/6/Add.1

Economic and Social Council

Distr.: General
11 March 1998

Original: English

Commission on Sustainable Development
Sixth session
20 April-1 May 1998

Capacity-building, education and public awareness, science and transfer of environmentally sound technology

Report of the Secretary-General

Addendum

Areas for policy action by Governments to accelerate the development, transfer and dissemination of environmentally sound technologies

Chapter 34 of Agenda 21

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98-07802 (E) 140498

I. Introduction

1. The present report supplements the information contained in section V (Transfer of environmentally sound technologies) of document E/CN.17/1998/6, and suggests areas for future action by Governments.

2. The report is based in part on the reports of the Expert Meeting on the Role of Publicly-funded Research in the Transfer and Diffusion of Environmentally Sound Technologies, organized by the Republic of Korea (Kyongju, 4-6 February 1998); the Technology Cooperation Workshop, held by the United Kingdom of Great Britain and Northern Ireland under the auspices of the Advisory Committee on Business and the Environment (London, 10 December 1997; and the European Roundtable on Business and Sustainability, hosted by European Partners for the Environment under the patronage of the European Council and the Commission of the European Communities (Brussels, 11 February 1998).

II. Trends related to the development, transfer and dissemination of environmentally sound technologies[1]

3. Since existing production and consumption levels are already responsible for environmental stress in many areas, the accelerated development and application of new technologies that could bring about considerable improvement in energy and material efficiency will be required to ensure sustainable development.

4. In order for companies to remain competitive and to meet increasingly stringent environmental standards, they will need to move towards greater eco-efficiency and cleaner production. The "trendsetters" will need to be companies in developed countries that have the resources and capacities to invest in best practices in environmental management and environmentally sound technologies. Emerging global standards for environmental management systems (for example, the Eco-Management and Audit Scheme (EMAS) and ISO 14000) have created strong incentives for this move to eco-efficiency and cleaner production.

5. Information and communication technology (ITC) is at the forefront of technological advances in environmental protection (environmental monitoring, risk control, management systems, simulation and so forth). ITC is also a means to spread best practices. The use of ITC for environmental protection, exchange of experience, information access and technology transfer is becoming an important success factor in efforts towards sustainable development.[2]

6. While necessary, the use of regulatory regimes alone is no longer regarded as sufficient to stimulate the adoption of environmentally sound technologies by companies. Increased emphasis is being put on a wider use of market-based instruments and voluntary approaches, including the adoption of environmental management systems, giving industry the choice of the means to achieve the goals and targets established by Governments, while providing the incentives for companies to innovate.[3]

7. Small and medium-sized enterprises (SMEs), especially in developing countries, have particular difficulties in adopting environmentally sound technologies and management systems, due to limitations in technological capacity, access to finance and information. As a result, SMEs often produce disproportionate amounts of industrial waste and pollution. Policies and programmes to promote sustainable development should include particular support to SMEs to enable them to acquire, use and manage environmentally sound technologies.

III. Areas for future action by Governments

A. Strengthening technology cooperation

8. Technology transfer to developing countries has an important role to play in achieving sustainable development objectives on a global scale. It stands the best chance of success when it builds upon partnership arrangements involving public and private sector actors from developed and developing countries. Cornerstones are shared responsibility, clear commitments, achievable targets, recognition of mutual benefits, building of confidence and dealing with cultural differences in a sensitive and positive way.

9. Partnerships use different mechanisms to transfer and disseminate environmentally sound technologies, such as joint ventures, direct investment, sourcing agreements, co-production arrangements, licensing, and strategic alliances between firms and R&D institutions. Training in management and technical skills and know-how should be part of technology partnerships. Intermediaries could help in these activities.

Box 1

European Union programme supports small and medium-sized enterprises

The European Union Structural Funds Programme (1994-1999) is providing 1 billion ECU for small and medium-sized enterprises, channelled through grants to member States and aimed at developing clean technologies and clean production within highly competitive markets.

Source: "1997 Guidelines on national reporting", Part V, "Guidelines on Technology", submitted by the Commission of the European Communities to the Commission on Sustainable Development at its present session.

Box 2

Disseminating best practices in business and industry

The European network, PREPARE, represents a group of cleaner production experts from industry, research and government from 18 countries. Its activities include the exchange of information on cleaner production technologies and cleaner production development (eco-design), the evaluation of results of cleaner production efforts as well as the stimulation of industry-oriented R&D projects. Currently, PREPARE is launching thematic networks in the field of cleaner production. One of the networks aims at disseminating environmental best practices in small and medium-sized enterprises in Europe.

Source: PREPARE secretariat.

10. Technology cooperation should consider the legal and political factors, institutional structures and social norms within which cooperative arrangements are implemented. Where companies conduct business in developing countries, they have a responsibility to ensure that the social dimension of their activities is also sustainable. It is important in this respect to involve, at an early stage, all relevant stakeholders in a multi-stakeholder dialogue.

1. Mechanisms for the transfer of environmentally sound technologies

11. Perhaps the simplest technology transfer process, making the least demand on technological capacity in the recipient country, is an intra-enterprise transfer, through direct investment. The parent enterprise located in a developed country provides the equipment, management structure, practical experience, training and often connections to export markets to its subsidiary located in a developing country. There is evidence, however, that the technology and practices transferred through direct investment, find limited dissemination to other enterprises or sectors of the recipient developing country. Governments could promote such transfers through financial incentives to enterprises, including tax incentives and investment guarantees.

12. Another mechanism is joint ventures between enterprises of developed and developing countries, either with or without licensing or other direct payment for the technology. Experience indicates that joint ventures tend to be more effective in disseminating new technologies, but require a relatively high level of commitment on both sides and well-developed capacities in the recipient enterprise for technology adaptation, use and management. In addition to the use of tax and investment incentives, Governments could promote joint ventures for the transfer of environmentally sound technologies by facilitating contacts between enterprises in developed and developing countries. Governments could also finance or otherwise support the dissemination of information on technologies and enterprises, participation in trade fairs, visits between enterprises, and contacts through government channels.

Box 3

Driving environmental business in Asia

The Commission of the European Communities and Singapore jointly established the Regional Institute for Environmental Technology (RIET) in Singapore to promote the transfer and exchange of environmental know-how and services between Europe and Asia. RIET's network contains many leading suppliers of environmental technologies and management companies from Europe and the Asia and Pacific region. To serve suppliers, RIET opened the door to over 4,000 customers in the region through market information, client-centred research, and business development support. Driving demand, RIET each year helps several hundred Asian companies address environmental problems through environmental management support and project or equipment brokerage. During the period 1997-2002, the European Community reserved 8 million ECU for the Asia EcoBest project to promote European environmental best practices in Asia.

Source: "Europe-Asia co-operation strategy in the field of environment" (COM(97)490-Final), communication from the Commission of the European Community to the European Council, the European Parliament and the Economic and Social Committee.

13. Where developing country enterprises or institutions have research and development capabilities in a particular area of technology, they could opt for entering into agreements with enterprises or institutions of developed countries to jointly develop and commercialize environmentally sound technologies. Such agreements require a high level of technological capability and the willingness to undertake relatively high-risk investments, but have the advantage of shared benefits resulting from the commercialization of the technology jointly developed, including joint patenting or licensing.

14. Licensing arrangements between enterprises in developed and developing countries is another mechanism to transfer technology. Licensing arrangements could involve partnerships or strategic alliances with the source enterprise, through supply agreements or cooperation in local or regional marketing. The recipient party may also use third-party assistance for the development of the capacity to commercialize technology. Governments could assist such licensing arrangements, through, for example, financial assistance for licensing costs and assistance in training and capacity-building of the recipient enterprise in the developing country.

2. Promoting technology cooperation between developed and developing countries

15. Governments, enterprises, R&D institutions and intermediaries concerned with technology development, transfer and dissemination are increasingly working together to accelerate the application of research results to commercial production. Different forms of technology cooperation are being created to combine the resources and capacities of the various partners in research, development, commercialization, adaptation, dissemination and further innovation. To date, this cooperation has been largely limited to developed countries. There is a need to extend them to include partners from developing countries.

16. Based on the work of the Technology Cooperation Workshop, organized by the United Kingdom under the auspices of the Advisory Committee on Business and the Environment, the following conclusions may be drawn.[4]

17. There is no single model for technology cooperation. Flexibility is essential to match the needs and capacities of technology users with market opportunities and the interests of technology suppliers. Supply and demand are interactive processes. Suitable technological solutions are often the result of merging high-tech industrial know-how, which is in the hands of technology suppliers in the developed countries, with low-tech indigenous knowledge existing on the side of the users in the developing country.

18. Successful technology cooperation often seems to be related to the application of technologies with a proven track record. This reduces the risk for the recipient and reassures providers of finance as to cost-effectiveness and predictability – especially for public sector authorities who tend to be more cautious than potential private sector

Box 4

United Kingdom Technology Partnership Initiative (TPI) has been successful

Since it was launched in 1993, TPI has made progress in developing a network of potential users of environmental technology and services. By the end of 1997, the number of network members had risen to nearly 6,000. It has gained international recognition in that TPI was one of the first to define the critical components for disseminating information about technology transfer. Although experience suggested that the basic components of TPI are right, adjustments are necessary in its strategy at the time of its renewal in April 1999, so as to achieve more hands-on, in-depth cooperation with key decision makers in participating developing and industrializing countries.

Source: TPI secretariat, Joint Environmental Market Unit, Department of Trade and Industry and Environment of the United Kingdom of Great Britain and Northern Ireland.

backers. Technologies with a proven track record may also be helpful in securing the support of local communities whose commitment is often a vital ingredient. However, at least some adaptation to local circumstances is almost always required, reinforcing the advantages of working with partners with local knowledge and experience and staying close to existing and potential customers.

19. Recipient companies or Governments sometimes lack trust in low-tech solutions. Other obstacles may relate to cultural factors, differences in business practices and structures, suspicions of "foreign" technology or technology with an unproven track record, or the discounting of technology unless it was seen as new or "fashionable". Pilot and demonstration projects are useful to overcome these and other obstacles and to demonstrate the viability of certain technologies under local circumstances.

20. There is, in principle, no shortage of information about technology needs or the range of available technologies. There are, however, problems regarding the availability of the "right" information reaching the right people in the right form. Developed country Governments and industry trade associations could do more to help their existing and potential technology suppliers, especially SMEs, with information on opportunities and requirements for technology transfer to developing countries, and encourage contacts with potential partners through missions and other networking activities. Developed countries could also support developing countries in undertaking technology needs assessment projects. A sectoral approach in both these areas appears to be most effective.

21. Official Development Assistance (ODA) should support and leverage assistance for management training and other programmes for capacity-building on the side of existing and potential technology users in developing countries. Intermediaries, including private and public sector consultancy services, information systems, technology centres and centres for enterprise development, should be used and further encouraged to undertake such activities.

B. Increasing the transfer and dissemination of environmentally sound technologies resulting from publicly funded research

22. In response to a specific recommendation in the Programme for the Further Implementation of Agenda 21,[5] the Republic of Korea sponsored a project on the role of publicly-funded research and publicly owned technologies in the transfer and diffusion of environmentally sound technologies. The project was jointly implemented by the United Nations Conference on Trade and Development, the Department of Economic and Social Affairs of the United Nations Secretariat and the United Nations Environment Programme. For the project, a number of country case studies and studies on selected policy, legal and institutional issues were carried out. The results of these studies were presented to an expert group meeting, organized by the Republic of Korea.[6]

23. The meeting concluded that public funding remains a major source for R&D activities and is particularly vital for R&D on environmentally sound technologies. Many Governments, especially of developed countries, have allocated considerable funds to finance or co-finance research activities for the development of new technologies, including environmentally sound technologies. A strong

Box 5

Photovoltaics in developing countries

The World Bank and the International Finance Corporation (IFC), with planned assistance from the Global Environment Facility (GEF), are developing a Solar Development Corporation (SDC) and a Photovoltaics Market Transformation Initiative (PVMTI). SDC and PVMTI should be launched shortly after an extended period of market research. The $30 million, GEF-funded PVMTI will make multiple investments from $500,000 to $5 million in existing and new consortiums in India, Morocco and Kenya that can offer innovative packages and applications for both on- and off-grid PV power.

Source: *Financial Times* (1 October 1997), p. 11.

Box 6

University Partnership for Knowledge Sharing

The Cooperation Programme in Europe for Research on Nature and Industry through Coordinated University Studies (COPERNICUS) represents an effort to mobilize the resources of European universities committed to sustainable development and environmental management. COPERNICUS functions as a networking tool for cooperation between universities in Europe to share knowledge and expertise and be a partner for industry and governmental authorities at the local level.

Source: COPERNICUS secretariat, Institute of Environmental Research, University of Dortmund, Germany.

interest of developed country Governments in funding research on environmentally sound technologies is to strengthen the international competitiveness of their industries and to facilitate companies' compliance with environmental regulations. A growing share of government R&D funding is being allocated to private sector research to develop new technologies.

24. The meeting noted that many Governments explicitly refer in their public policy statements to the need to share environmentally sound technologies with the developing world. It appeared, however, that the extent and pace at which environmentally sound technologies were being transferred to developing countries were inadequate. New policy initiatives are required to accelerate the transfer of publicly funded environmentally sound technologies to users in developing countries and to facilitate the dissemination of such technologies in those countries. Technical cooperation and ODA should assist in the transfer of environmentally sound technologies resulting from publicly funded research by supporting developing countries in the development of the capacities to assess, adapt, use and manage environmentally sound technologies. Environmental auditing services could help in identifying priorities for technology transfer.

25. Many environmentally sound technologies exist in the public domain that remain underutilized or unutilized. To make these technologies accessible to developing countries, a number of measures could be taken. For example, information on available environmentally sound technologies could be systematically compiled and made available through existing databases. Incentives could also be introduced to encourage technology suppliers to facilitate access of potential users in developing countries to the technologies, to assess user needs and to assist in technology adaptation.

26. Governments play an important role in building and strengthening strategic alliances for the generation, commercialization and dissemination of environmentally sound technologies that are the result of publicly funded research activities. Incentives should be provided to local R&D institutions to increase the output of marketable R&D

results on environmentally sound technologies. Intermediate mechanisms need to be created and strengthened that would work directly with firms and other end-users of technology. Many intermediate steps must be undertaken before the knowledge generated in R&D institutions can be used by potential end-users of technology. Such intermediary steps include the further development of the technology, pilot phases and demonstration projects. Moreover, intermediaries are often essential to find commercialization partners for R&D institutions and to provide follow-up services to firms.

C. Developing national technology strategies

27. Developing countries should develop policies to enhance the ability of their companies to compete in an increasingly competitive world economy. Technological development is essential to that process, and developing countries should harness their technological and entrepreneurial resources to that end.

28. The relationship between technological progress and economic performance is well established. Knowledge and new ideas are the primary source of economic growth because, together with an enabling business environment that rewards entrepreneurial innovation, they lead to technological innovation and hence to productivity improvements. If not enough resources are dedicated to scientific research and technological development, the rate of economic growth will suffer. Domestic R&D capacities are the basis not only for technology generation, but also for acquiring technological know-how from abroad, and ensuring that it can be exploited domestically.[7]

29. Most developing countries have inadequate levels of human resources, industrial capacity and infrastructure. In developing national technology strategies, developing countries should concentrate on improving the productivity of domestic companies in economic sectors in which comparative advantage and technological capacities best match.

30. Policies should be designed to strengthen technological innovation and adaptation capabilities. Strong technological capacities within research institutions and universities should be complemented by mechanisms to make them sensitive to the signals of the marketplace. Policy measures should target the building of institutional networks involving R&D institutions, companies and intermediaries to ensure rapid commercialization and adaptation of technological knowledge and know-how both from domestic and foreign sources.

Notes

[1] In the context of the present report, environmentally sound technology is used as a relative concept. What might be perceived as environmentally sound today may not necessarily be so tomorrow. Moreover, any technology must be viewed in relation to the socio-economic and cultural conditions in which it is operating. A narrow definition of environmentally sound technologies seems to be neither helpful nor desirable. Discussion on this issue may benefit from a categorization of environmentally sound technologies, as attempted by the United Nations Environment Programme.

[2] See "Europe-Asia co-operation strategy in the field of environment" (COM (97)490-Final) communication from the Commission of the European Communities to the European Council, the European Parliament and the Economic and Social Committee.

[3] See the Chairman's summary of the Roundtable on Business and Sustainability, hosted by European Partners for the Environment under the patronage of the European Council and the Commission of the European Communities (Brussels, 11 February 1998).

[4] See the summary report of the Technology Cooperation Workshop, held by the United Kingdom under the auspices of the Advisory Committee on Business and the Environment (London, 10 December 1997).

[5] General Assembly resolution S-19/2, annex, para. 91.

[6] For the report of the International Expert Meeting on the Role of Publicly funded Research and Publicly owned Technologies in the Transfer and Diffusion of Environmentally Sound Technologies (Kyongju, Republic of Korea, 4-6 February 1998), see document E/CN.17/1998/12.

[7] Michael Borrus and Jan Stowsky, *Technology Policy and Economic Growth*, BRIE Working Paper No. 97 (Berkeley, California, University of California at Berkeley, April 1997), p. 2.